

FIG. 1

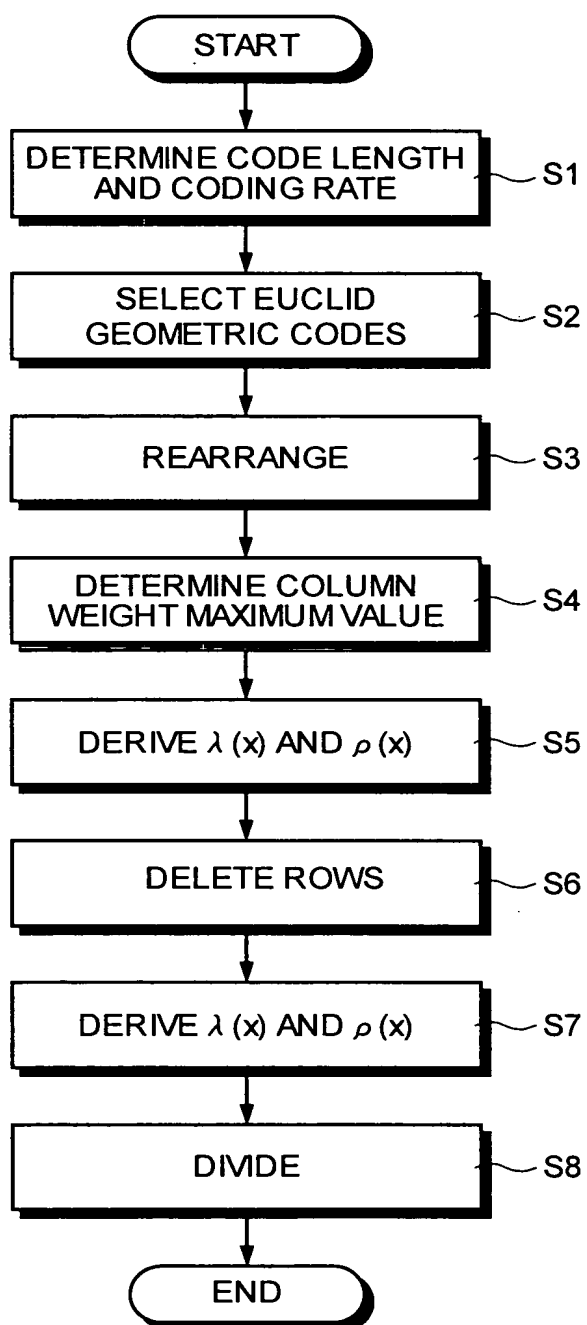


FIG.2

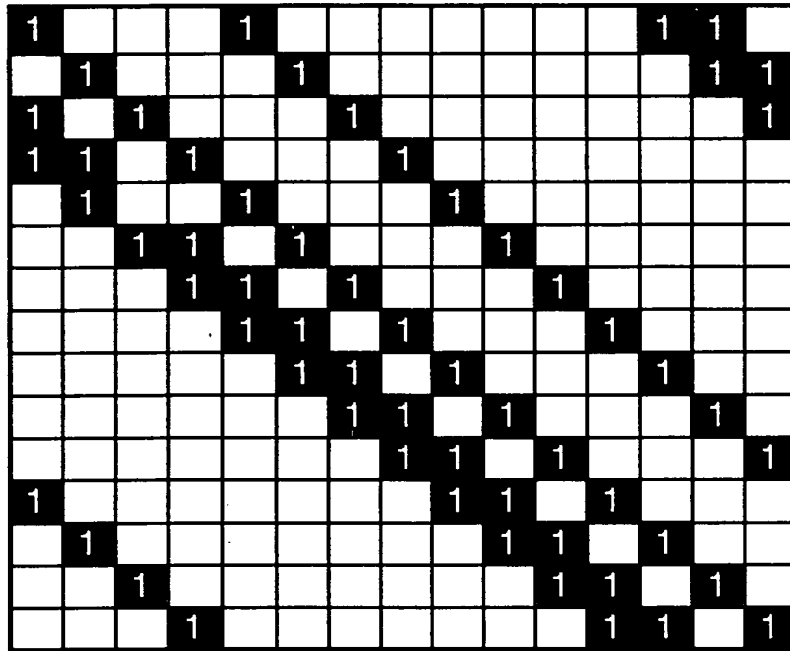


FIG.3

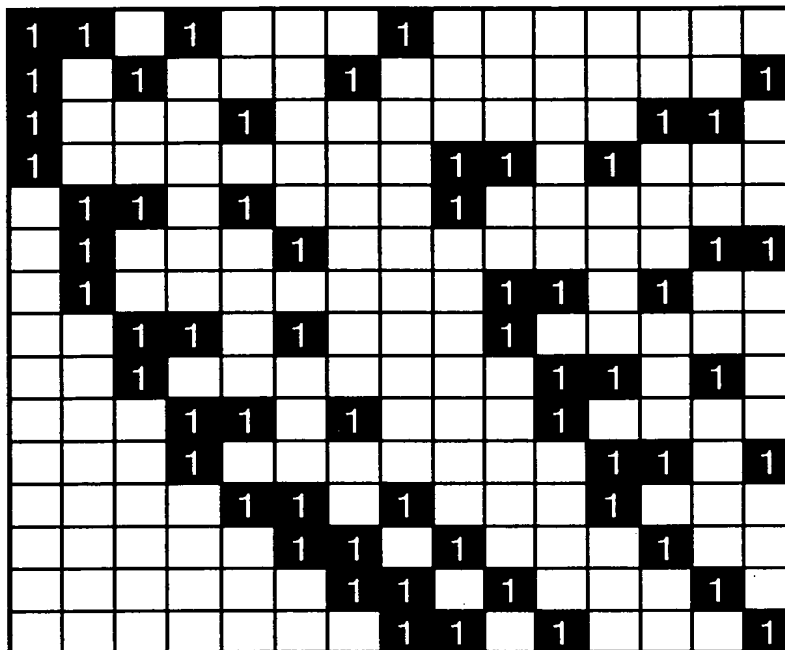


FIG.4

d_l	12	
Rate	0.5	
	x	λ_x
	2	0.221354
	3	0.281879
	6	0.021475
	7	0.0001
	10	8.71E-05
	12	0.475104
	X	ρ_x
	8	0.92192
	9	0.07808
σ_{GA}	0.946711	
$SNR_{norm}(GA)$	0.2886dB	

FIG.5

d_l	12	
Rate	0.5	
	x	λ_x
	2	0.221354
	3	0.281879
	6	0.021475
	7	0.0001
	12	0.475104
	X	ρ_x
	8	0.92192
	9	0.07808
σ_{GA}	0.946736	
$SNR_{norm}(GA)$	0.2884dB	

FIG.6

d_l	12	
Rate	0.5	
	x	λ_x
	2	0.224033
	3	0.282078
	6	0.033481
	7	0.000166
	12	0.460242
	X	ρ_x
	8	1
σ_{GA}	0.947054	
$SNR_{norm}(GA)$	0.2855dB	

FIG.7

1	2	3	4	5	6	7	8	9	10	11
	X	Λ_x							X	λ_x
VARIABLE NODE (COLUMN)	2	0.224033399	5376.802	2688.401	2688	5376	5372	2686	2	0.223833333
	3	0.282077752	6769.866	2256.622	2257	6771	6777	2259	3	0.282375
	6	0.033481078	803.5459	133.9243	134	804	804	134	6	0.0335
	7	0.000166151	3.98762	0.56966	1	7	7	1	7	0.000291667
	12	0.46024162	11045.8	920.4832	920	11040	11040	920	12	0.46
TOTAL		0.582003275	24000	6000	6000	23998	24000	6000		1
	X	ρ_x							X	ρ_x
CHECK NODE (ROW)	8	1	24000	3000	3000	24000	24000	3000	8	1
		1	24000	3000	3000	24000	24000	3000		1
rate		0.500000001								0.5
• TOTAL NUMBER TP OF 1S WITHIN COLUMNS=(1023-273)x32=24000										

FIG.8

d_l	12		
CODE LENGTH	6000		
	x	λ_x	No.
	2	0.223833	2686
	3	0.282375	2259
	6	0.0335	134
	7	0.000292	1
	12	0.46	920
	X	ρ_x	No.
	8	1	3000
σ_{GA}	0.946999		
$SNR_{norm}(GA)$	0.2860dB		

[illegible]

FIG.10

GO

2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
J	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
C(1)	1	LB(1)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C(2)	2	LB(2)	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	14	17	1	3	5	7	9	11	13	15	17	19	21	23	25	27
C(3)	4	LB(3)	3	6	9	12	15	18	21	24	27	30	7	11	2	5	8	11	31	16	20	23	26	29	32	22	1	4	7	10	13	16	19	22
C(4)	8	LB(4)	4	8	12	16	20	24	28	32	8	3	18	23	15	19	23	27	11	15	2	6	10	14	18	9	26	30	24	1	5	9	13	17
C(5)	16	LB(5)	5	10	15	20	25	30	5	3	17	13	29	10	28	10	1	6	28	14	21	26	31	21	4	20	14	19	14	29	26	2	7	12
C(6)	32	LB(6)	6	12	18	24	30	5	12	11	26	23	3	22	4	24	16	22	8	32	3	9	15	6	27	7	2	8	4	20	18	32	1	7
C(7)	27	LB(7)	7	14	21	28	3	11	19	19	7	6	14	9	17	1	31	1	25	13	22	29	20	28	13	31	27	23	31	11	10	25	32	2
C(8)	17	LB(8)	8	16	24	32	8	17	26	27	16	16	25	21	30	15	9	17	5	31	4	12	4	13	22	18	15	12	21	2	2	18	26	29
C(9)	31	LB(9)	9	18	27	3	13	23	3	6	25	26	10	8	6	29	24	12	22	12	23	32	25	20	8	5	3	1	11	30	31	11	20	24
C(10)	25	LB(10)	10	20	30	7	18	29	10	14	6	9	21	20	19	6	2	28	2	30	5	15	9	5	31	29	28	27	1	21	23	4	14	19
C(11)	13	LB(11)	11	22	2	11	23	4	17	22	15	19	32	32	32	20	17	7	19	11	24	18	30	27	17	16	16	16	28	12	15	27	8	14
C(12)	26	LB(12)	12	24	5	15	28	10	24	30	24	29	6	7	8	11	32	23	16	29	6	1	14	12	3	3	4	5	18	3	7	20	2	9
C(13)	15	LB(13)	13	26	8	19	1	16	31	1	5	2	17	18	21	25	10	2	13	10	25	21	19	19	26	27	29	31	8	31	28	13	27	4
C(14)	30	LB(14)	14	28	11	23	6	22	1	9	14	12	28	31	10	2	25	18	30	28	7	4	3	4	12	14	17	20	25	22	20	6	21	31
C(15)	23	LB(15)	15	30	14	27	11	28	8	17	23	22	2	6	23	16	3	13	10	9	26	24	24	26	21	1	5	9	15	13	12	29	15	26
C(16)	9	LB(16)	16	32	17	31	16	3	15	25	32	32	13	18	12	30	18	29	27	27	8	7	8	11	7	25	30	24	5	4	4	22	9	21
C(17)	18	LB(17)	17	1	20	2	21	9	22	4	4	5	24	30	25	7	11	8	7	8	27	27	28	18	30	12	18	13	32	32	25	15	3	16
C(18)	29	LB(18)	18	3	23	6	26	15	29	12	13	15	9	5	1	21	26	24	24	26	9	10	13	3	16	23	6	2	22	23	17	8	28	11
C(19)	21	LB(19)	19	5	26	10	31	21	6	20	22	25	20	17	14	12	4	3	4	7	28	30	18	25	2	10	31	28	12	14	9	1	22	6
C(20)	5	LB(20)	20	7	29	14	4	27	13	28	31	8	31	29	27	26	19	19	21	25	10	13	2	10	25	21	19	17	2	5	1	31	16	1
C(21)	10	LB(21)	21	9	32	18	9	2	20	7	3	18	5	4	3	12	14	1	6	29	16	23	32	11	8	7	6	29	24	30	24	10	28	
C(22)	20	LB(22)	22	11	1	22	14	8	27	15	12	28	16	16	16	17	27	30	18	24	11	19	7	17	20	32	32	19	15	22	17	4	23	
C(23)	3	LB(23)	23	13	4	26	19	14	4	23	21	1	27	28	29	31	5	9	15	5	30	2	28	2	6	19	20	21	9	6	14	10	28	18
C(24)	6	LB(24)	24	15	7	30	24	20	11	31	30	11	1	3	5	8	20	25	32	23	12	22	12	24	29	6	8	10	26	25	6	3	23	13
C(25)	12	LB(25)	25	17	10	1	29	26	18	2	2	21	12	15	18	22	13	4	12	4	31	5	17	9	15	30	21	25	16	16	27	26	17	8
C(26)	24	LB(26)	26	19	13	5	2	32	25	10	11	31	23	27	31	13	28	20	29	22	13	25	1	31	1	17	9	14	6	7	19	19	11	3
C(27)	11	LB(27)	27	21	16	9	7	1	32	18	20	4	8	2	7	27	6	15	9	3	32	8	22	16	24	4	22	3	23	26	11	12	5	30
C(28)	22	LB(28)	28	23	19	13	12	7	2	26	29	14	19	14	20	4	21	31	26	21	14	28	6	1	10	28	10	29	13	17	3	5	30	25
C(29)	7	LB(29)	29	25	22	17	17	13	9	5	1	24	30	26	9	18	14	10	6	2	15	11	27	23	19	15	23	18	3	8	32	28	24	20
C(30)	14	LB(30)	30	27	25	21	22	19	16	13	10	7	4	1	22	32	29	26	23	20	16	31	11	8	5	2	11	7	30	27	24	21	18	15
C(31)	28	LB(31)	31	29	28	25	27	25	23	21	19	17	15	13	11	9	7	5	3	1	17	14	32	30	28	26	24	22	20	18	16	14	12	10
C(32)	19	LB(32)	32	31	31	29	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5

Basic Random sequence

permutation pattern of basic random sequence

permutation pattern of basic random sequence

Basic Random sequence

FIG.11

q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
$L_q(1)$	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9
$L_q(2)$	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10
$L_q(3)$	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16
$L_q(4)$	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24
$L_q(5)$	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25
$L_q(6)$	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28
$L_q(7)$	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23
$L_q(8)$	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5
$L_q(9)$	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8
$L_q(10)$	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12
$L_q(11)$	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31
$L_q(12)$	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14
$L_q(13)$	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30
$L_q(14)$	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21
$L_q(15)$	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4
$L_q(16)$	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6
$L_q(17)$	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17
$L_q(18)$	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7
$L_q(19)$	29	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15
$L_q(20)$	2	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29
$L_q(21)$	3	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2
$L_q(22)$	27	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3
$L_q(23)$	22	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27
$L_q(24)$	26	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22
$L_q(25)$	18	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26
$L_q(26)$	1	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18
$L_q(27)$	20	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1
$L_q(28)$	32	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20
$L_q(29)$	11	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32
$L_q(30)$	13	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11
$L_q(31)$	19	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13
$L_q(32)$	9	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19

FIG.12

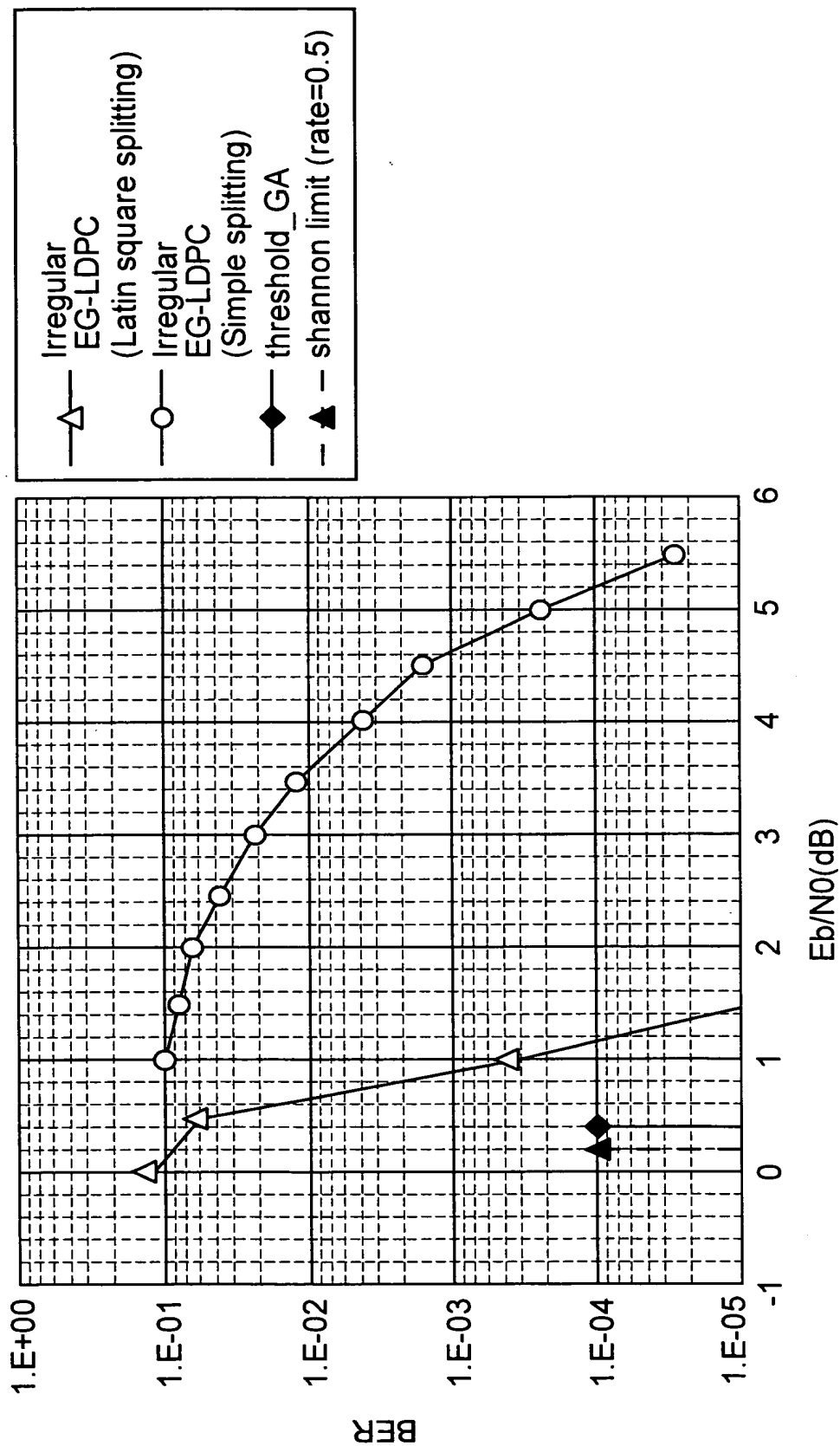


FIG. 13

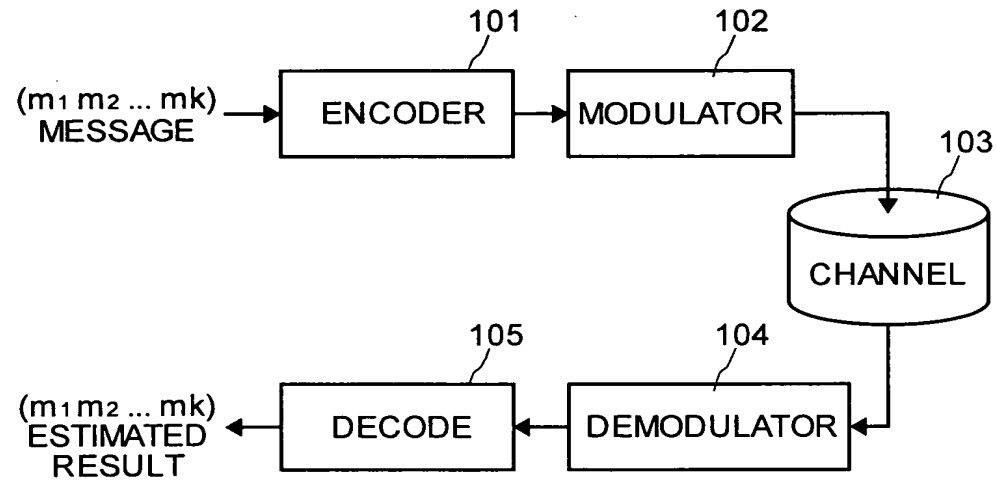


FIG. 14

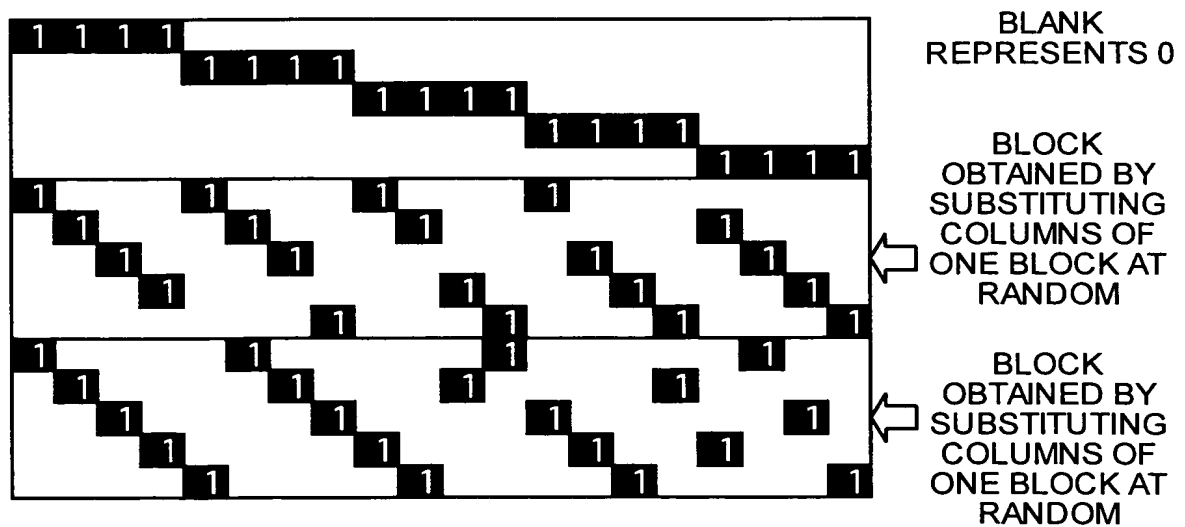


FIG. 15

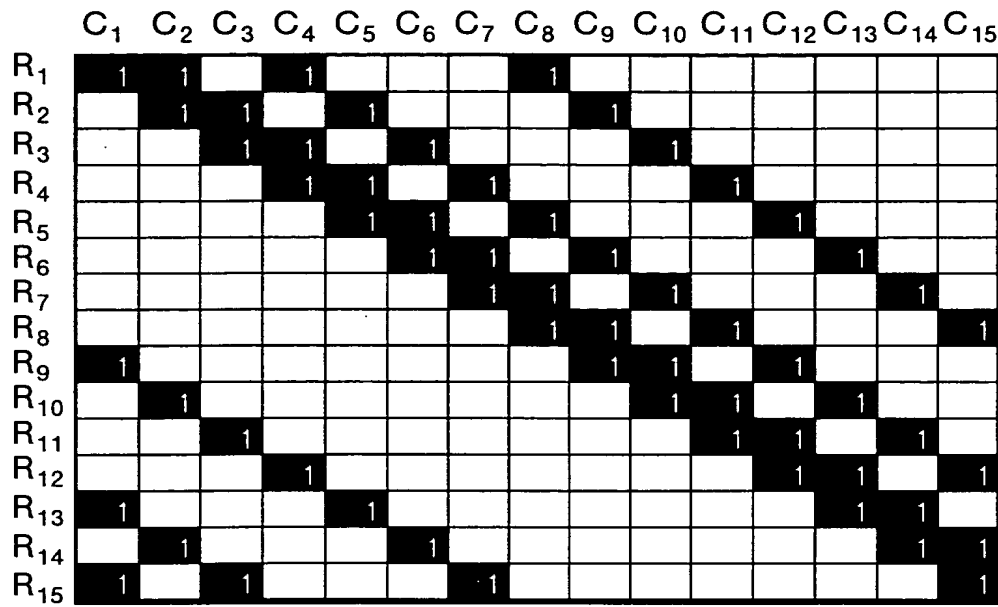


FIG. 16

